CLAIMS

1. A method for routing data packets through a switch fabric said switch fabric connecting a plurality of broadband buses, said switch fabric containing a plurality of switches each with several ports and having interconnections between them, said switch fabric being connected to said buses using portal devices, the method comprising:

(a) connecting the switches in a three-dimensional architecture providing horizontal data routing according to addresses and vertical data routing according to packet types;

(b) executing an allocation procedure to manage the bandwidth resources of said fabric resulting with assigning routing tables at the switches and portals;

(c) encapsulating packets prior to forwarding to the switch fabric; and,

(d) executing a hop-by-hop packet flow through said switches of said switch fabric said packet flow controlled by

an output port having an output port state machine and an output port concentrator.

The switch fabric may be a single component or constructed from a number of components.

2. A method according to claim 1, wherein packet flow is controlled by said output port state machine, a RQRS protocol and a MLIP protocol.

3. A method according to claim 2, further comprising: executing a RQRS protocol for negotiating a primary packet transfer, said RQRS protocol comprising the steps of:

(a) selecting at a switch output port a primary packet to be transferred and generating a fabric request data packet;

(b) transferring the fabric request packet over the switching fabric to an adjacent input port;

(c) determining acceptability of the fabric request and generating a fabric response packet indicating grant or denial of the request; and,

(c) transmitting said fabric response packet back to the originating switch and inputting the denial or grant of said selected packet to the output port state machine.

4. A method according to claim 2, further comprising: executing said MLIP protocol for sharing a connection, CIO, between a plurality of packets, said MLIP protocol comprising the steps of:

(a) receiving data at input ports while transmitting a packet;

(b) checking for interrupt conditions while transmitting the packet;

(c) in the event of interrupt conditions, ceasing transmission of the current packet, transmitting a control character indicating end of transmission, storing necessary data needed to subsequently resume the transmission, and starting negotiating a new packet transfer under said RQRS protocol; and

(d) upon ending a packet transmission, checking if an interrupted packet is awaiting completion and resuming transmission of any interrupted packet.

5. A method according to claim 4, the output port concentrator selecting the next packet to be forwarded from the output memory, comprising:

(a) selecting a new packet to be transferred if:

(i) said output port is in idle state and at least one packet is ready for transmission; and

(ii) said output port is currently in transmission state while a new packet has arrived in full, and interrupt conditions are met;

(b) selecting the packet to be transferred according to parameters selected from the group including a layer priority when higher layer equals higher priority, a rejection number, a queue size, and natural priority; and

(c) starting said RQRS protocol process utilising a switch timer for the management of said selected packet's denials.

6. A program storage device readable by a machine and encoding a program of instructions for executing the method steps of claim 1.

7. A computer readable medium, on which is stored a computer program of instructions for controlling a general purpose computer to route data packets in a switch fabric between a plurality of broadband buses, the switch fabric containing a plurality of switches each with several ports and having interconnections between them, the switch fabric being connected to said buses using portal devices, comprising in combination:

means for connecting the switches in a three-dimensional architecture providing horizontal data routing according to addresses and vertical data routing according to packet types;

means for executing an allocation procedure to manage the bandwidth resources of said fabric resulting with assigning routing tables at the switches and portals;

means for encapsulating packets prior to forwarding to the switch fabric; and,

means for executing a hop-by-hop packet flow through said switches of said switch fabric; and,

means for controlling packet flow from an output port with an output port state machine and an output port concentrator.

8. A computer readable medium according to claim 7, further comprising means for controlling packet flow by said output port state machine, a RQRS protocol and a MLIP protocol.

9. A computer readable medium according to claim 8, further comprising means for executing a RQRS protocol for negotiating a primary packet transfer, comprising:

means for selecting at a switch output port a primary packet to be transferred and generating a fabric request data packet;

means for transferring the fabric request packet over the switching fabric to an adjacent input port;

means for determining acceptability of the fabric request and generating a fabric response packet indicating grant or denial of the request; and,

means for transmitting said fabric response packet back to the originating switch and

inputting the denial or grant of said selected packet to the output port state machine.

10. A computer readable medium according to claim 8, further comprising means for executing said MLIP protocol for sharing a connection, CIO, between a plurality of packets, comprising:

means for receiving data at input ports while transmitting a packet;

means for interrupting current data transfer upon detection of interrupt conditions;

means for ceasing transmission of the current packet, transmitting a control character indicating end of transmission, storing necessary data needed to subsequently resume the transmission, and starting negotiating a new packet transfer under said RQRS protocol; and

means for upon ending a packet transmission, checking if an interrupted packet is awaiting completion and resuming transmission of any interrupted packet.

11. A computer readable medium according to claim 7, the output port concentrator selecting the next packet to be forwarded from the output memory, comprising:

means for selecting a new packet to be transferred if:

(i) said output port is in idle state and at least one packet is ready for transmission; and

(ii) said output port is currently in transmission state while a new packet has arrived in full, and interrupt conditions are met;

means for selecting the packet to be transferred according to parameters selected from the group including a layer priority when higher layer equals higher priority, a rejection number, a queue size, and natural priority; and

means for starting said RQRS protocol process utilising a switch timer for the management of said selected packet's denials.

12. A switching fabric comprising a three-dimensional architecture providing horizontal data routing according to addresses and vertical data routing according to packet types, the switch fabric including a plurality of input and output ports for connection to a bus or other network traffic carriers.

13. A switching fabric according to claim 12, wherein output ports of at least some of the switches are connected to an input port of another switch to form the three-dimensional architecture.

14. A switching fabric according to claim 13, wherein each switch has a numeric identifier n, wherein the nth input and output of the switch is reserved for transmission and receipt of switch fabric routing packets.

15. A switching fabric according to claim 12, further comprising a concentrator connected to at least some of the output ports of at least some of the switches, the concentrator being arranged to select the next packet to be forwarded from the output ports to exit the switching fabric.

16. A data communications network including a switching fabric system inter-connecting a plurality of buses and facilitating inter bus isochronous and asynchronous data communication, the plurality of buses being connected to said switching fabric via portal devices, the switching fabric comprising a plurality of switches interconnected by a three dimensional array of CIO connections, the network further comprising a network management node for data flow control for transferring packets from one of said buses to at least one of a plurality of said buses, thereby enabling unicast, multicast and broadcast of data packet transfer.

17. A network according to claim 16, wherein each of said switches is a three-dimensional switch having an output port memory organisation to support said inter-bus data communication.

18. A network according to claim 16, wherein each bus is a multimedia broadband bus of the IEEE1394 type.